REMARKS

Claims 9-12 were pending and under consideration. Claims 1-8 and 13-23 previously were canceled.

In the Office Action of November 5, 2001, the Examiner stated that Figure 1 should be designated by a legend and rejected claims 9-12 under 35 U.S.C. §102(b).

In response, Applicant amends Figure 1. Moreover, Applicant asserts that Nunoue does not qualify as prior art under 35 U.S.C. §102(b). Further, Applicant encloses documents to predate Nunoue's June 16, 1997 U.S. filing date.

I. Drawings

The Examiner stated that Figure 1 should be designated by a legend because that which is old is illustrated.

Since Applicant has made the appropriate changes as noted, Applicant respectfully requests that the Examiner withdraw the request to designate Figure 1 by a legend.

II. 35 U.S.C. §102(b): Claims 9-12

The Examiner rejected claims 9-12 under 35 U.S.C. §102(b) as anticipated by Nunoue (US 5,905,275).

Applicant asserts that Nunoue does not qualify as prior art under 35 U.S.C. §102(b). The present application is a divisional of U.S. Patent App. No. 09/316,044. Since Applicant filed U.S. Patent App. No. 09/316,044 on May 21, 1999, the effective filing date of the present application is May 21, 1999. Further, since the May 18, 1999 issue date of Nunoue was less than one year before the May 21, 1999 effective filing date of the application, Nunoue does not qualify as prior art under 35 U.S.C. §102(b). Accordingly, Applicant respectfully requests that the Examiner withdraw the rejection.

III. Use of Foreign Documents to Antedate Nunoue's June 16, 1997 U.S. Filing Date

As a U.S. patent reference, Nunoue is effective prior art as of its June 16, 1997 U.S. filing date. Applicant has enclosed with this Response a 37 C.F.R. §1.131 Affidavit. The 37 C.F.R. §1.131 Affidavit establishes invention of the subject matter of claims 9-12 on or before Nunoue's June 16, 1997 effective date. Applicant requests that Nunoue not bar the grant of a patent.

The enclosed 37 C.F.R. §1.131 Affidavit is unsigned. Applicant will submit a signed 37 C.F.R. §1.131 Affidavit as part of a Supplemental Response "D" to the November 5, 2001 non Final Office Action.

IV. Conclusion

In view of the foregoing, it is believed that the claims now pending are in condition for allowance. Such action is earnestly solicited at the earliest possible date. If the Examiner believes that a conference would be of value in expediting the prosecution of this application, the Examiner is invited to telephone the undersigned counsel to arrange for such a conference.

Respectfully submitted,
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Dated: May 6, 2002

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SONNENSCHEIN NATH & ROSENTHAL P.O. Box 061080 Wacker Drive Station, Sears Tower Chicago, IL 60606-1080 Attorney Customer Number: 026263 Phn: (312) 876-8000 Fax: (312) 876-7934	**CERTIFICATE OF MAILING** I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage in an envelope addressed to: Box Fee Amendment, Commissioner for Patents, Washington, D.C. 20231 on May 6, 2002. Rose M. Garza 5.6.02 Rose M. Garza Date: May 6, 2002

V. APPENDIX TO RESPONSE "C" TO NON FINAL OFFICE ACTION: VERSION WITH MARKINGS TO SHOW CHANGES MADE

SPECIFICATION

The paragraph beginning at page 1, line 9:

Nitride III-V compound semiconductors constraining GaN as the major component are direct transitional semiconductors having forbidden band widths ranging from 1.9 eV to 6.2 eV and enabling realization of light emitting devices theoretically capable of emitting light over a wide range from the visible spectrum to the ultraviolet. For these properties, semiconductor light emitting devices using GaN semiconductors have been placed under active developments. Additionally, GaN semiconductors have a large possibility as material of electron mobility ~~deices~~ devices. Saturation electron velocity of GaN is approximately $2.0x10^7$ cm/s, which is larger than those of GaAs and SiC, and its breakdown electric field is as large as approximately $5x10^6$ V/cm next to the intensity of diamond. For these natures, GaN semiconductors have been expected to be greatly hopeful as materials of high-frequency, high-power semiconductor devices.

The paragraph beginning at page 5, line 7:

The above-made discussion applies to the case where GaN FET is made on a sapphire substrate. However, the same problem also lies in the case where GaN FET is made on a SiC substrate ~~which~~ that is very ~~had~~ hard and chemically stable, similarly to sapphire substrates.

The paragraph beginning at page 8, line 21:

When a substrate of a hard material such as sapphire substrate is ~~sued~~ used, diamond powder is a sole granular abrasive material acceptable for use in lapping. In general, thickness of the layer changed in quality or strained by lapping processing approximately amounts several times the grain size of the abrasive grains used there. Therefore, if the substrate should be thinned to a thickness around 20 nm, for example, since the thickness of

the sapphire substrate before being thinned is usually about 400 μm, for thinning it, it is first processes by lapping, using an abrasive liquid containing diamond granular abrasive material with the grain size of 30 μm, for example. In this case, if it is further thinned, then the ratio of the strained layer relative to the remainder substrate will increase, and a large strain will invite warpage or breakage of the substrate. Then, by using a diamond granular abrasive material with a smaller grain size as large as 10 μm, for example, it is processed by lapping to a thickness around 100 μm, for example. As a result, the strained layer made by the preceding lapping can be removed. However, another strained layer of a thickness of decades of μm newly appears. Therefore, by next using an abrasive liquid containing a granular abrasive material with a grain size around 1 μm, for example, it is processed by lapping or polishing to a thickness around 40 μm.

The paragraph beginning at page 9, line 21:

In case of GaAs substrates, the strained layer produced by lapping has been fully removed conventionally by ~~mechano~~ mechanical-chemical polishing. More specifically, it has been known that the strained layer can be removed completely by polishing the substrate in hypochlorous acid solution containing micro soft grains. However, As to sapphire substrates, no polishing in such solution has been known. Then, consideration is made on using the following method. That is, an appropriate amount of sulfuric acid is added to phosphoric acid, and the temperature is held at 280 °C. This liquid has an etching rate around 10 μm/hr for sapphire. High-temperature phosphoric acid has been known to have an etching function of sapphire (for example, (5) Ceramics Processing Handbook, Kensetsu Sangyo Chosakai (1987)). However, direct exposure of a ~~dev ice~~ device to such a high-temperature corrosive solution invites characteristic deterioration of the device and wiring. Therefore, there is the need for a countermeasure to ensure that phosphoric acid never touches the device side. For this purpose, a first effective measure is to bring only the bottom surface into

contact with the liquid, and a second effective measure is to make a protective film on the device side. Effective as the protective film are a SiO_2 film made by CVD, oxide or nitride film such as SiN film having a resistance to phosphoric acid, and heat-resistant polyimide film, for example.

The paragraph beginning at page 14, line 1:

Here again explained are merits of thinning sapphire substrates. As shown in Fig. 6, thermal conductivity of sapphire is as small as approximately 0.4 W/cmK at the room temperature and has a large negative gradient relative to temperature, that is, it becomes lower as the temperature rises. In the case where a device using GaN semiconductors on a sapphire substrate, heat from the ~~dev ice~~ device during operation moves to the sapphire substrate due to heat conduction. In case of a high-power ~~dev ice~~ device, heat is radiated through a heat sink typically made on the bottom surface of the substrate. However, the fact that heat conductivity of sapphire decreases with increase of temperature means that heat radiation becomes difficult as the temperature rises. Therefore, from the viewpoint of heat radiation, it is advantageous that the sapphire substrate supporting the device is as thin as possible, and it is preferable to thin the substrate to the limit within a range acceptable for mechanical strength. By thinning in this level, efficient heat radiation is ensured, and the increase in temperature can be alleviated.

The paragraph beginning at page 16, line 13:

In the first aspect of the invention, the single-crystal substrate is thinned typically by lapping to a thickness not larger than 100 μm, or a thickness not larger than decades of μm. In order to prevent any damage to the device upon etching for removing a strained layer by lapping, the surface of the device made on one major surface of the single-crystal substrate is preferably covered by a protective film having a resistance to the etchant prior to the etching. Usable as the protective film are, for example, a silicon oxide (SiO_2) film, silicon nitride

(SiN) film ~~are~~, or polyimide film. During the etching, it is preferable to immerse only the other major surface of the single-crystal substrate into the etchant.

The paragraph beginning at page 26, line 3:

That is, as shown in Fig. 9, a Pt container 31 in form of a Petri dish containing an etchant 32 of H_3PO_4/H_2SO_4 mixed liquid by $H_3PO_4/H_2SO_4=1:1$ is put on the hot plate 30. The etchant 32 is previously heated to an etching temperature by the hot ~~late~~ plate 30. Thereafter, held on the etchant 32 is a float cover 33 of a doughnut-shaped Pt plate having an outer diameter slight larger than the diameter of the Pt container 31 and an inner diameter slightly smaller than the diameter of the sapphire substrate 21. At that time, the float cover 33 is held so that its upper surface ~~be in~~ is at the same level as the liquid surface of the etchant 32. The float cover 33 is used to prevent evaporation of moisture from the etchant 32 of H_3PO_4/H_2SO_4 mixed liquid to thereby maintain composition of H_3PO_4 constant, and also to ensure that only the bottom surface of the sapphire substrate 21 contacts the etchant 32. Then, the sapphire substrate 21 is put on the float cover 33 to align its outer circumferential with the inner circumferential edge of the float cover 33. In this state, only the bottom surface of the sapphire substrate 21 contacts the etchant 32. As a result, only the bottom surface of the sapphire substrate 21 is etched, and a strained layer produced by lapping is removed.